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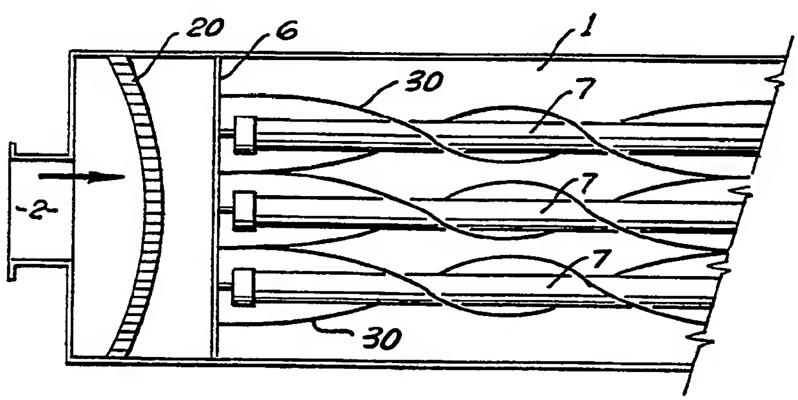

(57) Abstract

A disinfectant system is provided for disinfecting an air stream flowing through a section of ventilation ductwork (1). The disinfecting system has a first baffle (20), disposed substantially across transverse direction of the duct (1), for redistributing the air. Specifically, the first baffle (20) achieves a substantially even redistribution of the velocity and pressure of the air stream in the transverse direction. The first baffle is concave in shape and is oriented with the concave portion of the baffle in the downstream (3) direction. The first baffle (20) has a plurality of apertures (22) formed in it and has deflectors (24) disposed in the apertures (22) for imparting a rolling motion to the air stream. The first baffle (20) reduces the turbulence of the air stream from a turbulent flow to a transitional flow. Ultraviolet lamps (7), are positioned downstream of the first baffle (20) and are powered by a power supply (9) and actuated by a control box (8). The lamps (7) irradiate the air stream to disinfect it. Second baffle (30) spirals around the lamps (7) and further reduces the turbulence of the air flow to a substantially laminar flow. The second baffle (30) imparts a rolling motion of the air flow around the lamps (7), lengthens the path of the air stream around the lamps (7), and increases the exposure time. In this way, the first and second baffles (20) and (30) redistribute the air and modify the air stream from a substantially turbulent flow upstream of said first baffle (20) means to achieve a substantially laminar flow of the air stream around the lamps.

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DISINFECTANT SYSTEM

The present invention relates to disinfectant systems, and more particularly to a system for disinfecting air passing through air conditioning systems, such as those used in office buildings.

Background of the Invention

Although it is well known that a number of different bacteria, germs, and viruses can pass through air-conditioning systems, there is not much effort being made, to date, to try to clean the air passing through such a system. Some attempt is made during regular service intervals by spraying an antibacterial agent around the air-conditioning ducts but this is clearly an event that occurs once every six to twelve months and the rest of the time no disinfecting action occurs. Furthermore, if too much anti-bacterial agent is sprayed into the system at any one time, this can enter the offices and irritate persons present in the building.

There exists a system to spray bactericides continuously into air-conditioning ducts. The levels of bactericides are low enough not to harm humans and, consequently, have little effect upon bacterial levels. With the present interest in the possible harmful affects of passive smoking, i.e., the breathing in by a non-smoker of smoke exhaled by a smoker, it is also desirable to try to remove as much smoke from the air-conditioning system of an office building where, perhaps, air passes from an office used by a smoker to an office used by a non-smoker, who thereby has a degree of passive smoking.

Various approaches to disinfecting air passing through an air handling system, such as an air-conditioning or heating system have been employed. Among the approaches is the use of ultraviolet ("UV") lamps. Specifically, air passing through the ventilation system is subjected to UV radiation from the lamps, killing bacteria, germs, moulds and viruses.

Typically, most of the biological contaminants are carried on dust particles entrained in the air stream. The effectiveness of UV radiation as a disinfectant system, however, depends on the exposure of the bacteria, germs, and viruses to the disinfecting radiation. In general, although a number of approaches relying on UV disinfection are known, none achieves the efficiency and effectiveness of killing biological contaminants achieved by the present invention. For example, Pacess, U.S. Patent No. 4,990,313 (February 5, 1991), for Ultraviolet Device, discloses an UV lamp mounted in line in an air return system of an air-conditioning unit to destroy cooling coil and drain pan bacterial accumulations, growth of mold spores or slime, dust mites, airborne diseases, pollens and pollutants, and to purify the return air. Pacess discloses a lamp, mounted between the air filter and the cooling coil, upstream of the fan. The lamp is simply mounted in line and no additional measures are taken to insure the effectiveness of exposure of biological contaminants in the air stream to the UV radiation.

Similarly, Goldstein, U.S. Patent No. 4,210,429 (July 1, 1980) for Air Purifier discloses a room air purifier having a pair of UV lamps, in combination with a series of high efficiency filter elements. Once again, however, no particular steps are taken to enhance the kill ratio by controlling the flow of air around the lamps.

Bohmemeieker, U.S. Patent No. 4,118,191 (October 3, 1978) for Gas Sterilization Apparatus also includes a UV lamp and a series of filters to filter out germs and to kill them on the surfaces of the filter elements. Specifically, Bohmemeieker discloses the improvement of a series of vanes to increase the turbulence of the flow before the air enters the kill chamber. Bohmemeieker's kill chamber comprises an UV lamp encased by filter elements.

Finally, Sokolik, U.S. Patent No. 2,777,759 (January 15, 1957) for Air Processing

Apparatus, discloses certain improvements in an air-conditioning apparatus to be installed in an air-heating or air-circulating system or combined heating and cooling system. Specifically, Sokolik's apparatus includes an elongated germicidal lamp oriented parallel to the direction of the air flow through the ventilation system. A helical deflector is disposed around the germicidal lamp so that it transverses the housing in which the lamp is mounted. Specifically, the helical member cooperates with the germicidal lamp to force the air stream flowing around the lamp in a helical path prolonging the exposure of the bacteria and other germs in the air stream to the lamp's UV rays.

Although these various known methods use UV radiation to kill germs, bacteria, and viruses in an air stream, none has achieved the high degree of efficiency of the present invention. Accordingly, there remains a need for an easy to use and maintain disinfectant system, that is inexpensive to install and operate, and will achieve high efficiencies in disinfecting air, as reflected by achieving high kill ratios of germs and other biological contaminants carried in the air stream.

Objects of the Invention

The primary object of the present invention is to provide a method and system for disinfecting air passing through air-conditioning, and other ventilation systems so as to try to overcome, or at least reduce the above problems.

A further object of the present invention is to provide an inexpensive disinfectant system.

Another object of the present invention is to provide a disinfectant system that is easy to install and to maintain.

An additional object of the present invention is to provide a disinfectant system

that is efficient to operate.

A further object of the present invention is to provide a disinfectant system that is compact.

Yet a further object of the present invention is to provide a disinfectant system that is compatible with the variety of ventilation systems that are commonly in use.

Another object of the present invention is to provide a disinfectant system that will achieve high kill ratios.

An additional object of the present invention is to provide a disinfectant system that is economical and can be readily adapted to various types of existing ventilation systems.

Summary of the Invention

Accordingly, the present invention overcomes the disadvantages of the prior art and achieves the objects of the invention by providing a disinfectant system for use in various types of known ventilation systems. The present invention provides an inexpensive, reliable, disinfectant system, that is easy to install and maintain, and is readily adapted to various types of ventilation systems that are commonly in use.

To achieve the objects, and in accordance with the purposes of the invention, as embodied and broadly described herein, the invention is a disinfectant system for disinfecting an air stream flowing through a section of ventilation ductwork having a first transverse direction, a second transverse direction substantially normal to the first transverse direction, and upstream and downstream directions, comprising: first baffle means, for redistributing the air in the ventilation system to achieve a substantially even redistribution of the velocity and pressure of the air stream in the first and second transverse directions, ultra-violet lamp means, disposed downstream of said first baffle

means, for irradiating the air stream flowing through the disinfection system; power supply means for supplying power to said ultraviolet lamp means; second baffle means, disposed downstream of said first baffle means, for reducing the turbulence of the air flow around said ultraviolet lamp means and for imparting a rolling motion to the air stream flowing around said ultraviolet lamp means; and whereby said first and second baffle means redistribute the air and modify the air stream from a substantially turbulent flow upstream of said first baffle means to achieve a substantially laminar flow of the air stream around said lamp means.

It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory only, and are not restrictive to the invention as claimed.

The accompanying drawings, which are incorporated herein by reference and constitute a part of this specification, illustrate one embodiment of the invention and, together with the description, serve to explain the principles of the invention.

Brief Description of the Drawings

The invention will now be discussed in more detail, with particular reference to the drawings.

Fig. 1 is a schematic cross-sectional side elevation through a system for disinfecting air passing through an air-conditioning duct.

Fig. 2 is a schematic cross-sectional view on line - II - II of Fig. 1.

Fig. 3 is a graph depicting the relationship between the velocity and cross-sectional position in a duct of a typical air-handling system, at a position downstream from the fan or blower of such a system, at a position where the present invention might be used.

Fig. 4 is a graph showing the relationship between air velocity and cross-sectional position of the air stream at a position immediately downstream of the first baffle of the present invention.

Fig. 5 is a frontal elevation view of a preferred embodiment of the first baffle of the present invention.

Fig. 6 is a partial cross-sectional elevation view of a portion of the disinfectant system of the present invention, showing a vertical cross-sectional elevation of the first baffle of the present invention and a portion of the UV lamps.

Fig. 7 is a vertical cross-sectional view of the disinfectant system invention, showing, in cross-section, the first baffle of the present invention and the disposition of the second baffle of the present invention around the lamps.

Fig. 8 is a transverse-vertical, cross-sectional view of the chamber of the present invention looking back toward the upstream end of the chamber.

Fig. 9 is a verticle, longitudinal, cross-sectional view of the disinfectant system of the present invention showing another embodiment of the disinfectant system of the present invention, comprising a single UV lamp.

Fig. 10 is a verticle, longitudinal, cross-sectional view of the disinfectant system of the present invention showing another embodiment of the present invention comprising multiple UV lamp elements.

Fig. 11 is an oblique view of the chamber of the present invention, showing the hinged cover of the housing for ease of access for maintaining the devise.

Fig. 12 is a detail of the portion identified in Fig. 10 of a preferred embodiment of the present invention comprising multiple UV lamp elements.

Fig. 13 is an exploded rear view of another embodiment of the present invention

viewed from a position downstream of the present invention.

Fig. 14 is an exploded frontal view of another embodiment of the present invention viewed from a position upstream of the present invention.

Detailed Description of the Drawings

Thus, as shown in the Figs. 1 and 2, a system according to one aspect of the present invention for disinfecting air in air-conditioning systems comprises a chamber (1) having an inlet (2) and an outlet (3) for connection to an air-conditioning duct. The inlet (2) can be provided with a fan (4), but this is not essential where the air-conditioning system itself provides adequate air flow. The chamber (1) is also provided with a deflection plate (20) adjacent to the inlet (2) so as to dissipate and cause turbulence in the air entering the chamber and thereby reduce any "dead spots" in the chamber where bacteria can promulgate. The chamber (1) is provided with mounting brackets (6) at spaced intervals, to which are mounted ultra-violet lamps (7). In an embodiment of the present invention, the ultra-violet lamps are longitudinal and arranged along the length of the chamber so that air passing through the chamber from the inlet to outlet passes along the length of the lamps. The lamps are preferably 30 watts, although lamps in the range of 30 to 250 watts are utilized and are controlled from a control box (8) powered from a power supply (9). The chamber (1) is preferably made of polished stainless steel plating so as to reflect the ultra-violet light back into the chamber. Alternatively, any appropriate, UV-resistant, reflective material could be used for the inner surface of the chamber (1).

In a trial system in which the chamber had a cross-section of 0.65 x 0.65 or 0.4225 square meters, the bacterium Escherichia Coli was injected into air passing into the inlet, and air filters were placed over the outlet so it could trap bacteria surviving the UV

disinfection for further analysis. The results of tests for different air velocities and flow rates providing different retention time for the air in the chamber are shown in Table I.

Table I

Velocity	Flow Rate	Retention Time (seconds)	No. Of Lamps	% Kill of E. COLI
1.5 m/s	16.8 L/S	37.7	2	97%
2.9 m/s	32.5 L/S	19.5	2	98%
4.1 m/s	46.0 L/S	13.8	2	97%
1.5 m/s	16.8 L/S	37.7	1	5%
2.9 m/s	32.5 L/S	19.5	1	9.5%
4.1 m/s	46.0 L/S	13.8	1	30%

The above results indicate that light penetration for a single lamp is poor, however, two such lamps provide ideal contact. It will be apparent that bacterial kill is dependent upon two factors - light penetration or contact and retention time. The above results indicate that a commercial unit would require a contact time of less than 13.8 seconds and a retention cross-section of 0.21 square meters per 30 watts of installed power.

In order to produce a disinfectant system according to the invention for commercial office systems, the following criteria need to be measured before an installation can proceed:

(i) Air velocity in primary duct work;

(ii) Duct sizing immediately downstream of the disinfectant system; and

(iii) Available space for the system.

It therefore appears that a 2000 square meter office space with a 3 meter ceiling would require fourteen 30 watt lamps or less. With higher air flow rates, i.e., in the region of 90 to 180 meter per second, retention times in the chamber would be between 7 and 3.5

seconds. In these cases, the 2000 square meter office would require between three and seven 30 watt lamps.

It has also been found that some UV lamps also produce a small amount of ozone. This also has a beneficial effect in disinfecting the air. However, other UV lamps which do not produce ozone could also be utilized in this system.

Description of the Preferred Embodiment

Reference will now be made in detail to a present preferred embodiment of the present invention, an example of which is illustrated in the accompanying drawings. A preferred embodiment of the invention is shown in Fig. 9 and 10 as (10). In accordance with the invention, Disinfectant System (10) comprises a chamber (1); first baffle means (20); UV lamps (7); and second baffle means (30). As shown in Fig. 9 and 10, in a preferred embodiment of the present invention, disinfectant system (10) is preferably mounted in the duct work of a ventilation system, downstream of fan (4).

Fig. 3 is a graph showing the variation of air velocity at a position downstream of fan (4) in a section of ventilation duct of the type well know in the art. Specifically, as shown in Fig. 3, the distribution of air velocity across the transverse dimension of a typical duct is not uniform. In an ideal system, boundry layer effects cause drag at the lateral margins of the duct work, slowing the air flow, and allowing a higher velocity to develop substantially in the center of the duct. In most duct work, however, the idealized velocity profile is replaced by a velocity profile of the type shown in Fig. 3. Specifically, rather than the highest velocity developing in the center of the duct as would be predicted in an idealized system, the velocity profile in known ducts is typically offset to one side of the duct.

For example, Fig. 3 depicts the velocity profile in a typical duct of the type known in the art measured from a position downstream of the fan, with the air stream directed normal to the plane of the diagram. Specifically, the velocity diagram of Fig. 3 would be characteristic of a rotary (propeller-type) fan of known construction oriented with its axis of rotation normal to the plane of the figure and rotating in a clockwise direction. Fig. 3 represents the velocity profile when viewed in a downstream direction along the duct. The Y axis of Fig. 3 depicts the transverse position across the duct, whereas the verticle axis depicts the relative velocity, in arbitrary units.

As can be seen in Fig. 3, although the idealized high velocity area described above develops, an eddy effect occurs in the ventilation chamber resulting in a low, or negative, velocity on the right hand side of the duct, as shown by the velocity profile in Fig. 3. This type of circulation pattern can result in short circuiting of the air flow in the duct work and the deposition of dust particles in low velocity areas. It compounds the difficulty in disinfecting the air passing through the duct work. The eddy effect could result in reinfection of the air stream in typical disinfection systems. Moreover, this type of air flow pattern is inefficient.

In a preferred embodiment of the present invention, disinfectant system (10) comprises first baffle means (20). The function of first baffle means is to break the flow of air established by the fan. Specifically, the first baffle redistributes the air to achieve a more even cross-sectional velocity downstream of first baffle (20). In a preferred embodiment of the present invention, the velocity profile of a typical cross-section of the chamber of the present invention, immediately downstream a first baffle (20) is shown in Fig. 4. As shown in Fig. 4, first baffle redistributes the air across the plenum, resulting in a more efficient distribution of velocity and pressure than is obtained in prior art systems.

As shown in Fig. 4 the extent of the boundary layer effect is reduced substantially. A more even distribution of velocity across the transverse width of the chamber is achieved.

In a preferred embodiment of the present invention, first baffle (20) has first apertures (22) formed therein. Further, as shown in Fig. 6, first apertures (22) have deflector means formed therein. In a preferred embodiment of the present invention, the first apertures (22) are approximately 4 millimeter in diameter. As shown in Fig. 6 and in Fig. 7, first baffle means (20) has a plurality of first apertures (22) formed therein. In a preferred embodiment of the present invention, first baffle means further comprises a deflector means (24) formed in each first aperture to deflect the flow of air and impart a rolling motion to the particles entrained in the air stream. In a preferred embodiment of the present invention deflector means (24) comprised tap threads formed in apertures (22). As embodied herein, 3 threads per aperture are provided and the threads are preferably spaced apart by a distance of 1 millimeter and are .3 millimeters in depth.

It will be apparent for those skilled in the art, that the various modifications and variations can be made in first baffle (20 and, in particular, in the apertures (22) and the deflector means (24) of the present invention, without departing from the scope or spirit of the invention. For example, in a preferred embodiment of the present invention, the apertures are dimensioned so that placement of vane deflectors of the type known in the art in the apertures (22) would be difficult. Accordingly threads are used to deflect the air stream. If the apertures (22) formed in first baffle means (20) are made to be roughly 40 to 50 millimeters in diameter, however, deflector vanes of various configurations could be placed in apertures (22) to impart a rolling motion to the air flow.

First baffle (20) is preferably a polyethylene sheet, approximately 50-60 mm thick. Alternative materials can also be used for first baffle. For example, any suitable UV

resistant material capable of creating the requisite head loss for the given flow characteristics could be used provided the effect shown in Fig. 4 is substantially achieved.

As a further example, first baffle could adopt a different configuration. Drift eliminators of a type known in the art could also be used in conjunction with the present invention. Brentwood Industries manufactures drift eliminators for cooling towers, which are sold in the trade under the designations DE-080 and DE-120. These devices employ a series of sinusoidal blades. The present inventors believe that these devices could function as first baffle of the present invention. Thus, it is intended that the present invention cover the modification and variations of the invention, provided they come within the scope of the intended claims and their equivalents.

In a preferred embodiment of the present invention, as shown in Fig. 6 and 7, first baffle means (20) has a concave shape, when viewed from the upstream direction (2). The concave shape of first baffle means (22), increases the velocity of air stream at the plenum or chamber (1) boundaries and achieves a more even distribution of the air flow. In addition, the disproportionate flow of air causes one side of the blades by the fan (4) to be broken up and redistributed more evenly, as shown in Fig. 4. Apertures (20) formed in first baffle means (20) help create a rolling motion at each aperture and in part, this rolling motion to dust particles passing through first baffle means (20). This rolling motion is helpful in allowing UV light to contact all sides of individual dust particles.

As shown in various of the attached figures, first baffle means (20) is attached to chamber (1) by supports (26). After the air stream has passed through first baffle (20) and assumed the velocity distribution characteristic of Fig. 4, it passes through the central portion of the chamber in which the UV lamps (7) are mounted. In a preferred embodiment of the present invention, UV lamps (7) are mounted in chamber (1) by

mounting brackets (6).

As noted above, the disinfectant system of the present invention further compresses second baffle (30).

A preferred embodiment of second baffle (30) is shown in Fig. 9 and 10 as (30). An alternative embodiment of second baffle (30) is shown in Fig. 7. As shown in the accompanying drawings, second baffle means (30) spirals around lamps (7) redirecting the air flow in a grossly laminar fashion around each lamp. Moreover, second baffle means (30) achieves this effect while not interfering with the rolling motion imparted to the individual dust particles by first baffle means (20). In a preferred embodiment of the present invention, a unique air flow is achieved as a result of the cooperation of first and second baffles with lamps (7) to achieve superior disinfecting action, and in particular, a superior kill rate relative to the known prior art disinfectant systems. Specifically, the turbulence of a fluid flow can be depicted mathematically by a measure known as a Reynolds Number. In a typical cross-section of air velocity in a duct of known type, such as that shown in Fig. 3, the turbulence of the air flow downstream a fan (4) can be characterized by Reynolds number in the range of ten-to-the-sixth to ten-to-the-seventh. As embodied herein, first baffle (20) redistributes the air flow and reduces the turbulence to the range of ten-to-the-third and ten-to-the-fourth. This results in a flow that is characterized by the transitional range between laminar and turbulent air flow. As the air progress to second baffles (30) surrounding the lamps, the redistribution of the air flow evens the flow slightly, reducing the turbulence to the range of approximately ten-to-the-third. This is typically understood to be marginally in the range of laminar flow. The present inventors believe that the advantages of the present invention are achieved, in part, by controlling the turbulence and distribution of the air flow to manipulate the rolling

motion of the particles in combination with a substantially laminar air flow, characterized by marginal and turbulent Reynolds number. In this way the effectiveness of the UV lamp, in killing biological contaminants, is enhanced, and the kill ratio is increased to the levels achieved by the present invention.

The net effect of both baffles is to maximize the contact between the UV light and all faces of individual dust particles. In addition, the spiral baffles (30) ensure that the areas around the lamps remain at optimal velocity, to prevent dust accumulation on the horizontal surfaces of the lamps. Trial with dust particles collected from air-conditioning ducting indicated that directing air around the lamps by use of the spiral baffles (30) of the present invention, prevents dust accumulation on the upper surfaces of the lamps.

In summary, the first and second baffles, (20) and (30) respectively, achieve certain advantages. First, they break the fan velocity profile and create a more even distribution of air velocity across the transverse and verticle dimensions of the duct. Second, deflectors means (24) of first baffle means (20) impart a rolling motion to the dust particles exiting the first baffle. Third, first and second baffles, create a unique air flow around the lamps ensuring the dust does not collect on the upper lamp surfaces. The present inventors have confirmed these observations through experimental trials.

The results of certain of these experiments will help to explain the principles of the invention and to identify for those skilled in the art the sensitivity of certain of the operational parameters of the invention.

Example I

A pilot disinfecting system of the present invention was built. The test system was run and produced the following results:

Velocity	Flow Rate	Retention Time (seconds)	No. Of Lamps	% Kill of E. COLI
2.9 m/s	23.5 L/S	19.5	2	95%
4.9 m/s	54.9 L/S	11.5	2	94%
7.0 m/s	78.4 L/S	8.1	2	22%

The present inventors believe that the poor results obtained in the last trial was a result of a large amount of dust being drawn into the fan system.

Example 2

Subsequent tests were conducted using two 30 watt lamps, disposed in the ductwork in series. A first series of trial produced an 82% kill rate at an outlet of 3m downstream of the lamps. Reinfection with dust reduced the kill rate to 20% 6m downstream of the lamps. The ducting was treated with ozone prior to retesting. Both tests were conducted at an air flow of 85 L/s. The following results were obtained:

Location	Prior to Treatment	Post Treatment	%
1	5 bacteria 2 mould	3 bacteria 1 mould	40/50
2	6 bacteria 2 mould	2 bacteria 1 mould	67/50
3	4 bacteria 3 mould	3 bacteria 1 mould	25/67

Locations 1, 2, and 3 were 4m, 5m, and 6m from the ducting outlets respectively. The results indicate that even after 24 hours treatment there is significant reduction in viable bacteria counts and mould spores that are detected on agar plates.

It will be apparent to those skilled in the art that various modifications and variations can be made to the chamber, first baffle (20), apertures (22), deflector means (24), second baffle (30), and lamps (7) of the present invention without departing from the scope or spirit of the invention. Thus, it is intended that the present invention cover the modifications and variations of the invention provided they come within the scope of the appended claims and their equivalents.

We claim:

1. A disinfectant system for disinfecting an air stream flowing through a section of ventilation ductwork having a first transverse direction, a second transverse direction substantially normal to the first transverse direction, and upstream and downstream directions, comprising:

first baffle means, for redistributing the air in the ventilation system to achieve a substantially even redistribution of velocity and pressure of the air stream in the first and second transverse directions;

ultra-violet lamp means, disposed downstream of said first baffle means, for irradiating the air stream flowing through the disinfecting system;

power supply means for supplying power to said ultraviolet lamp means;

second baffle means, disposed downstream of said first baffle means, for reducing the turbulence of the air flow around said ultraviolet lamp means and for imparting a rolling motion to the air stream flowing around said ultraviolet lamp means; and

whereby said first and second baffle means redistribute the air and modify the air stream from a substantially turbulent flow upstream of said first baffle means to achieve a substantially laminar flow of the air stream around said lamp means.

2. The disinfecting system of Claim 1, whereby said second baffle means increases the exposure time of the air stream to the ultraviolet radiation from said lamp means.

3. The disinfecting system of claim 1, wherein said first baffle means is disposed substantially across the first and second transverse directions of the ventilation system ductwork.

4. The disinfecting system of claim 1, wherein said first baffle means has a plurality of apertures formed therein for allowing the passage of the air stream through said first baffle means.

5. The disinfecting system of claim 1, wherein said first baffle means has a plurality of apertures formed therein for allowing the passage of the air stream through said first baffle means and further comprises deflector means formed in each of said apertures for imparting a rolling

motion to the air stream.

6. The disinfecting system of Claim 1, wherein said lamp means further comprises longitudinal and transverse directions, and said second baffle means comprises a deflector plate disposed in spiral relation to said lamp means and along the longitudinal direction of said lamp means in the downstream direction.

7. The disinfecting system of claim 1, wherein the air stream is characterized by substantially turbulent flow at a position upstream of said first baffle means, by substantially transitional flow at a position downstream of said first baffle means and upstream of said second baffle means, and by substantially laminar flow at a position downstream of said second baffle means.

8. A disinfectant system for disinfecting an air stream flowing through a section of ventilation ductwork having first and second transverse directions disposed substantially normal to one another, and upstream and downstream directions, comprising:

first baffle means, for redistributing the air in the ventilation system to achieve a substantially even redistribution of the velocity and pressure of the air stream in the first and second transverse directions,

wherein said first baffle means is concave when viewed looking in the down stream direction of said ventilation system,

wherein said first baffle means has a plurality of apertures formed therein, and

wherein said first baffle means further comprises deflector means disposed in said apertures for imparting a rolling motion to the air stream;

ultra-violet lamp means for irradiating the air stream flowing through said ventilation system;

power supply means for supplying power to said ultraviolet lamp means;

second baffle means for reducing the turbulence of the air flow around said ultraviolet lamp means to achieve a rolling motion of the air flow around said lamp means to increase the exposure time of the air stream to the ultraviolet radiation from said lamp means; and whereby said first and second baffle means redistribute the air and modify the air stream from a substantially turbulent flow upstream of said first baffle means to achieve a substantially laminar flow of the air stream around said lamp means.

9. The disinfecting system of claim 8, wherein said first baffle means is disposed substantially across the first and second transverse directions of the ventilation system ductwork.

10. The disinfecting system of claim 8, wherein said first baffle means has a plurality of apertures formed therein for allowing the passage of the air stream through said first baffle means.

11. The disinfecting system of Claim 8, wherein said lamp means further comprises longitudinal and transverse directions, and said second baffle means comprises a deflector plate disposed in spiral relation to said lamp means and along the longitudinal direction of said lamp means in the downstream direction.

12. The disinfecting system of Claim 8, wherein the air stream is characterized by substantially turbulent flow at a position upstream of said first baffle means, by substantially transitional flow at a position downstream of said first baffle means and upstream of said second baffle means, and by substantially laminar flow at a position downstream of said second baffle means.

13. A disinfectant system for disinfecting an air stream flowing through a section of ventilation ductwork having first and second transverse directions disposed substantially normal to one another, and upstream and downstream directions, comprising:

first baffle means, disposed substantially across the first and second transverse directions of the ventilation system ductwork, for redistributing the air in the ventilation system to

achieve a substantially even redistribution of the velocity and pressure of the air stream in the first and second transverse directions,

wherein said first baffle means is concave when viewed looking in the down stream direction of said ventilation system;

wherein said first baffle means has a plurality of apertures formed therein for allowing the passage of the air stream through said first baffle means, and

wherein said first baffle means further comprises deflector means disposed in said apertures for imparting a rolling motion to the air stream;

ultra-violet lamp means for irradiating the air stream flowing through said ventilation system;

power supply means for supplying power to said ultraviolet lamp means;

second baffle means for reducing the turbulence of the air flow around said ultraviolet lamp means to achieve a rolling motion of the air flow around said lamp means to increase the exposure time of the air stream to the ultraviolet radiation from said lamp means;

whereby said first and second baffle means redistribute the air and modify the air stream from a substantially turbulent flow upstream of said first baffle means to achieve a substantially laminar flow of the air stream around said lamp means.

14. The disinfecting system of Claim 13, wherein said lamp mans further comprises longitudinal and transverse directions, and said second baffle means comprises a deflector plate disposed in spiral relation to said lamp means and along the longitudinal direction of said lamp means in the downstream direction.

15. The disinfecting system of Claim 13, wherein said lamp means further comprises a plurality of ultraviolet lamps, each of said lamps having longitudinal and transverse directions, and said second baffle means comprises a deflector plate disposed in spiral relation to each of said

lamp means and along the longitudinal direction of each of said lamp means in the downstream direction.

16. The disinfecting system of Claim 13, wherein the air stream is characterized by substantially turbulent flow at a position upstream of said first baffle means, by substantially turbulent flow at a position upstream of said first baffle means, by substantially transitional flow at a position downstream of said first baffle means and upstream of said second baffle means, and by substantially laminar flow at a position downstream of said second baffle means.

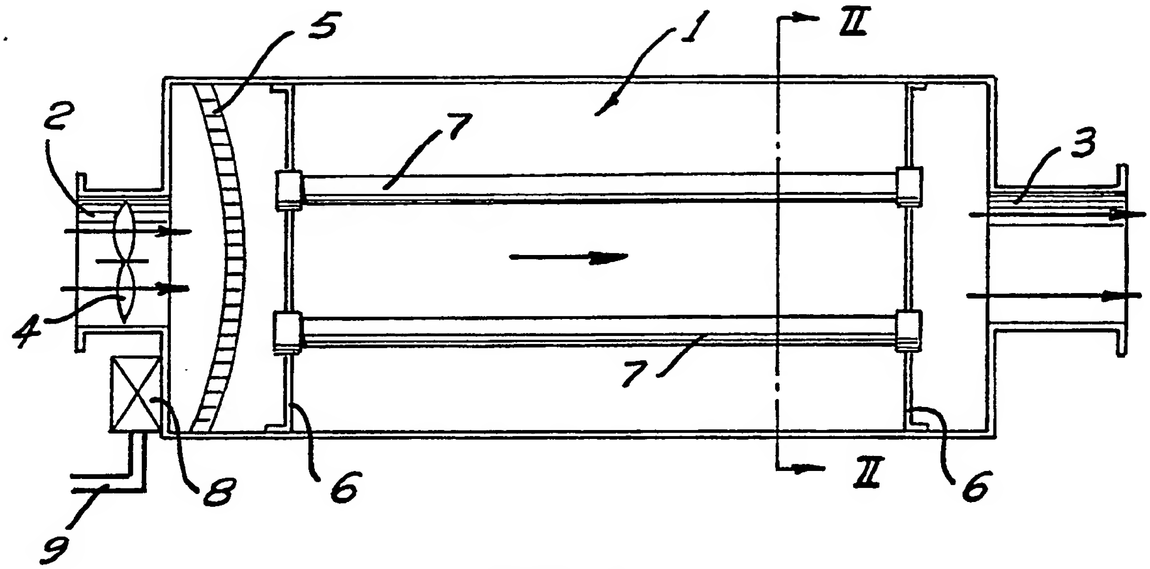

FIG.1

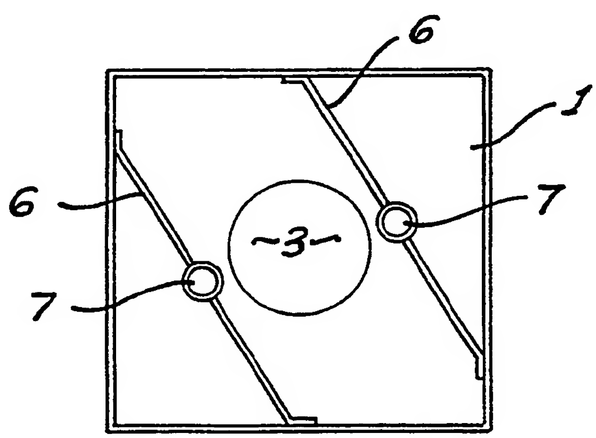

FIG.2

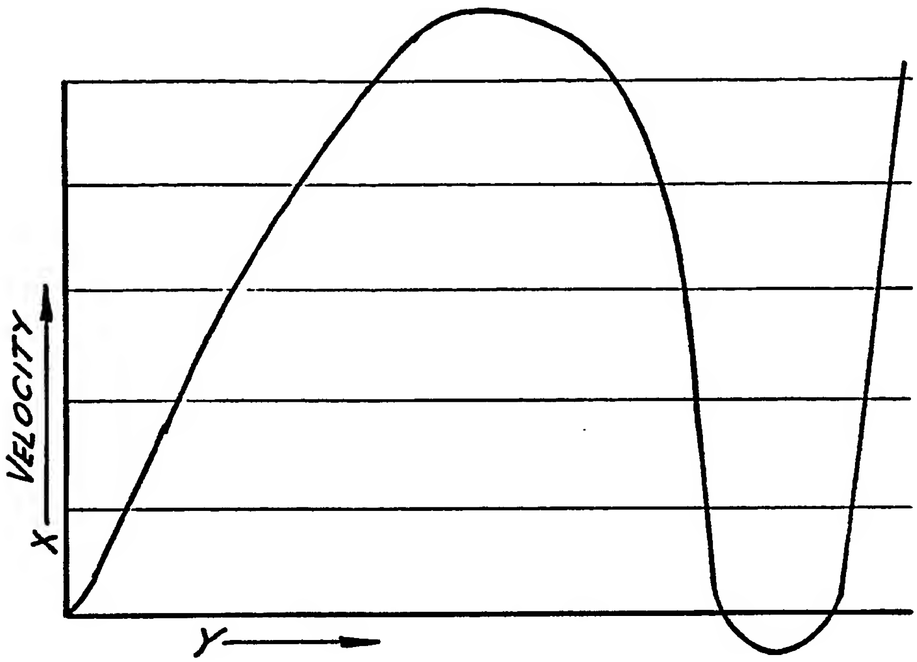

FIG. 3

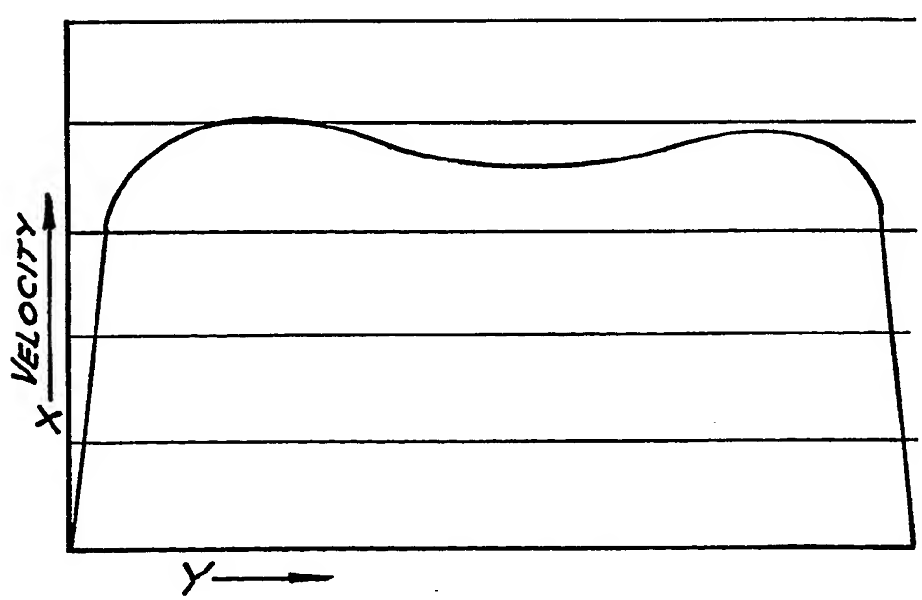

FIG. 4

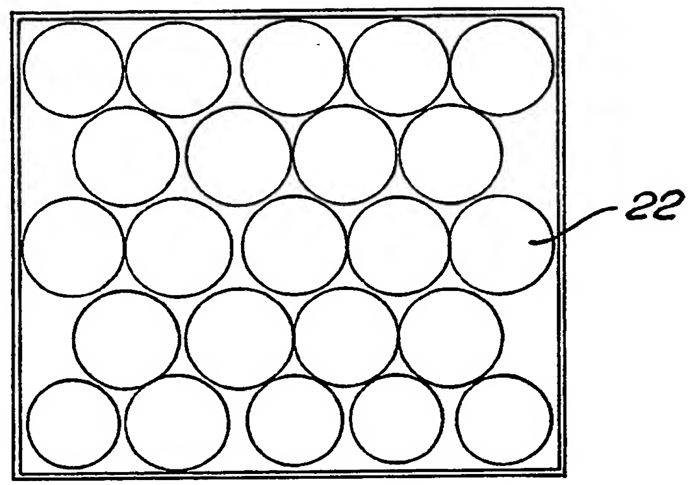

FIG. 5

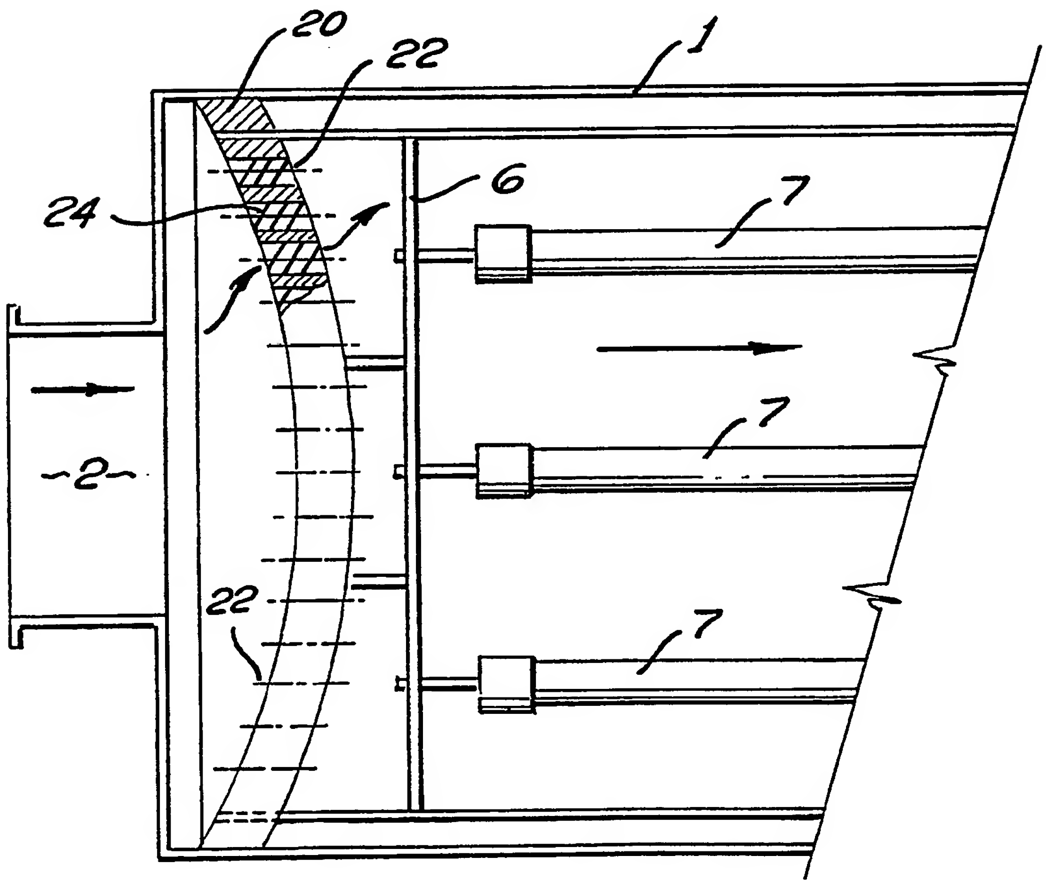

FIG. 6

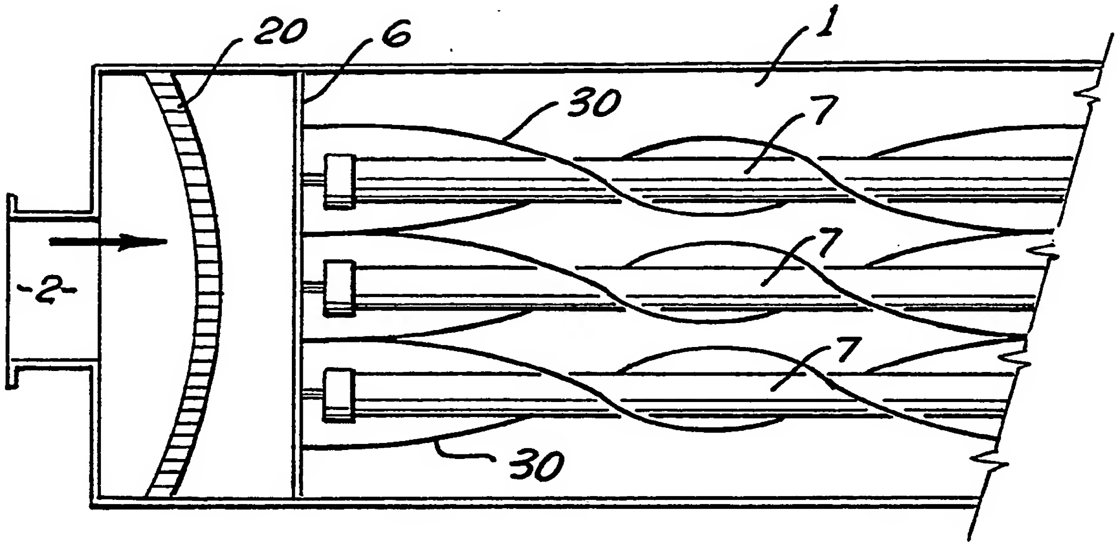

FIG. 7

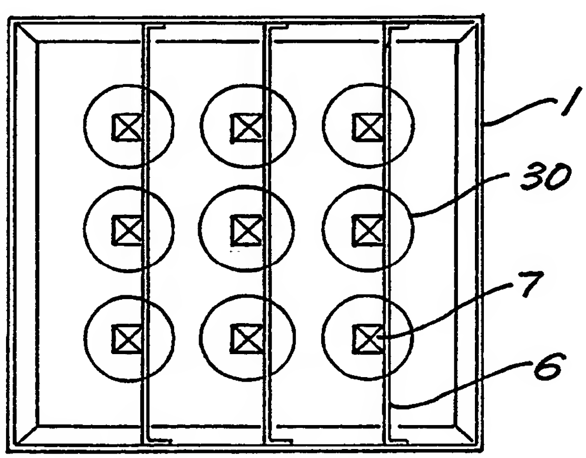

FIG. 8

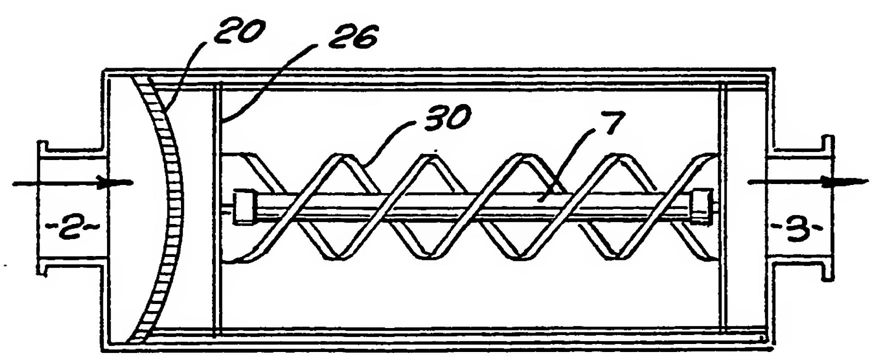

FIG. 9

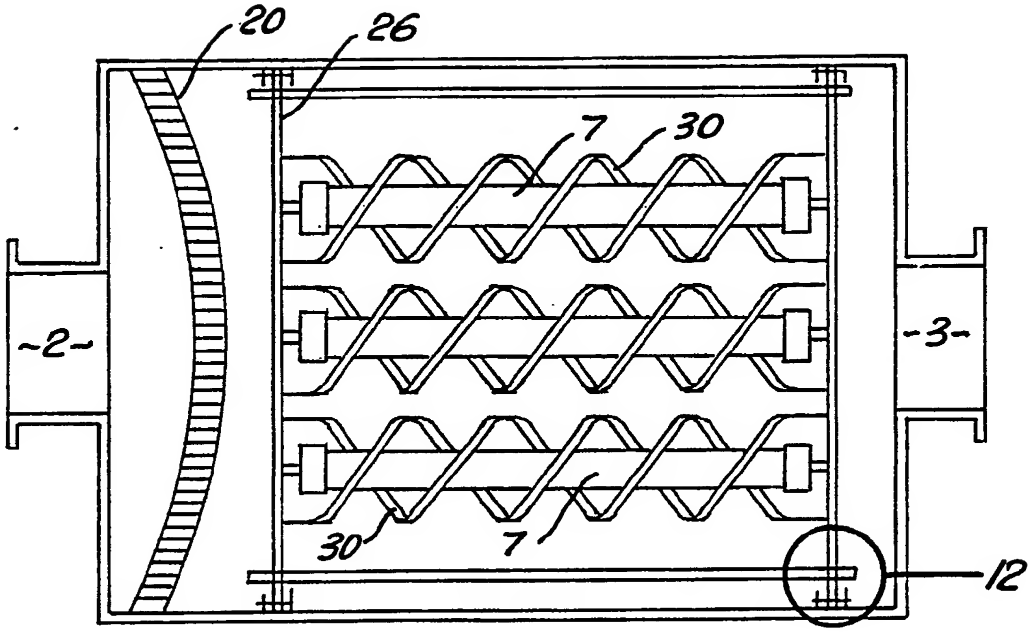

FIG. 10

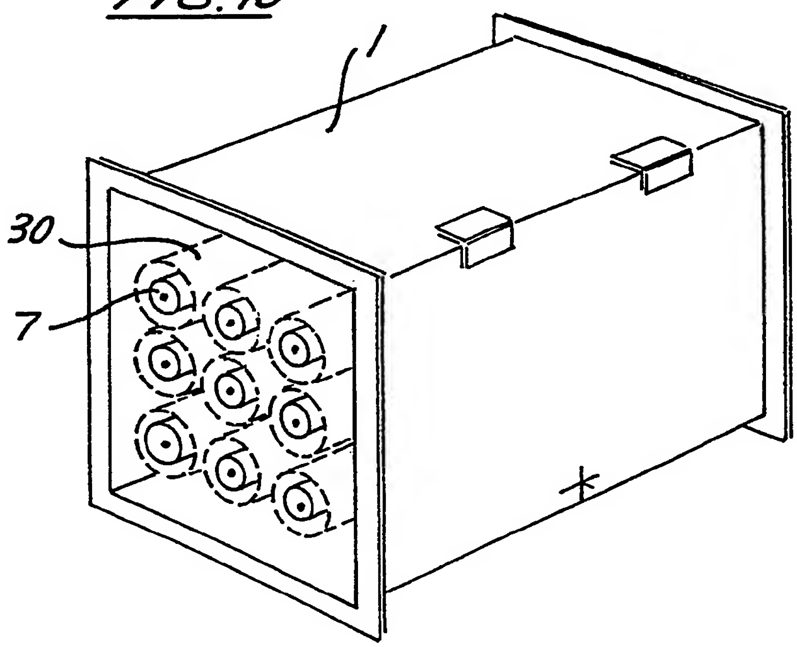

FIG. 11

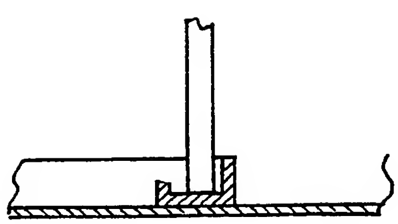

FIG. 12

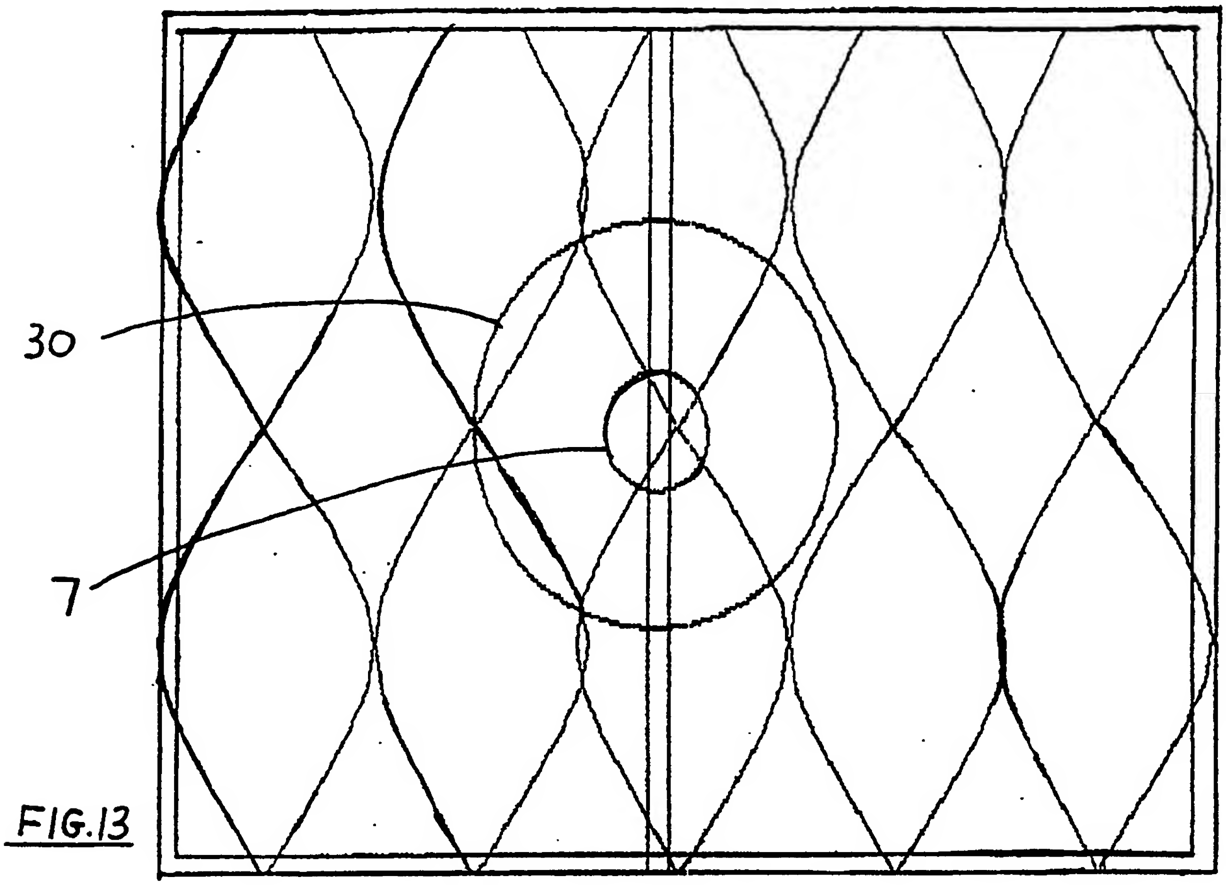

FIG.13

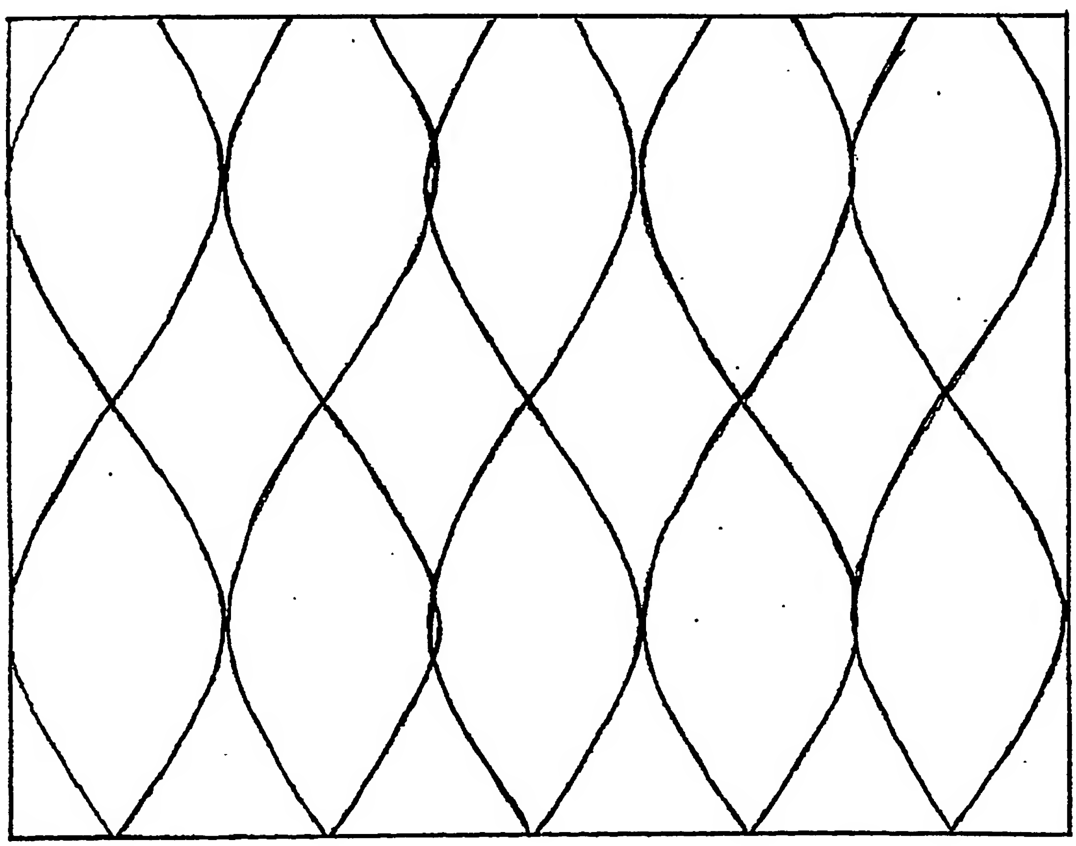

FIG.14

INTERNATIONAL SEARCH REPORT

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)[6]

According to International Patent classification (IPC) or to both National Classification and IPC
Int. Cl.[5] F24F 3/16, A61L 9/20

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC	F24F 3/16 A61L 9/20

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [8]

AU: IPC as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category*	Citation of Document, [11] with indication, where appropriate of the relevant passages [12]	Relevant to Claim N [13]
Y	AU,B, 35970/63 (280417) (UNION CARBIDE CORP.) 1 April 1965 (01.04.65). See figure 3 and page 10 lines 2-23	1-3
Y	US,A, 4118191 (BOHNENSIEKER) 3 October 1978 (03.10.78). See figure 3 and column 5 line 45-column 6 line 30.	1-3
A	US,A, 3176447 (OMOHUNDRO) 6 April 1965 (06.04.65). See figure 1 and column 4 lines 6-40.	
A	US,A, 2350665 (ALEXANDER) 6 June 1944 (06.06.44). See figures 4-7 and column 2 line 37 column 3 line 35.	
	(continued)	

* Special categories of cited documents : [10]

"A" Document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior t the international filing date but later than the priority date claimed

"T" Later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
14 August 1992 (14.08.92)	21 aug 1992 (21.08.92)
International Searching Authority	Signature of Authorized Officer
AUSTRALIAN PATENT OFFICE	R G Tolhurst

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category*	Citation of Document, [11] with indication, where appropriate of the relevant passages [12]	Relevant to Claim No [13]
A	FR,A, 1388709 (FAVORY) 3 June 1965 (03.06.65)	
A	US,A, 3846072 (PATTERSON) 5 November 1974 (05.11.74). See figure 3 and column 4 lines 30-52.	

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL APPLICATION NO. PCT/AU 92/00221

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report	Patent Family Member		
US 3846072	CA 1009822	US 3967927	US 3975790
US 4118191	CH 614628 GB 1536397	DE 2618127 JP 52131687	FR 2349337 SE 7704641

END OF ANNEX